TECHNICAL METHODS AND DEFINITIONS FACT SHEET

(See the Users Guide for a more detailed description of the methods used)

Incidence

Police-reported counts of impaired-driving crashes were obtained from State departments of transportation, highway safety, or highway patrol. The data year varies according to the most recent data available during the collection period unless data from the previous year were more complete. Only one year's data are reflected in each State's cost estimates. The year is identified in the first sentence of each State cost fact sheet.

Fatality counts for 1996 through 2000 by blood alcohol concentration (BAC) came from NHTSA's Fatality Analysis Reporting System (FARS). The U.S. fact sheet uses 2000 FARS data from NHTSA's new multiple imputation method. The individual State, District of Colombia, and Puerto Rico fact sheets use FARS numbers from NHTSA's old method, because that was what was available when they were prepared. Police under-reporting of alcohol-involvement in crashes is well documented. Police reported counts of impaired-driving injury crashes were adjusted for under-reporting according to the methods in Blincoe, Seay et al. (2002). Incidence of property damage only crashes was estimated from the ratio of property damage only alcohol-related crashes to injury crashes from Blincoe, Seay et al. (2002). Alcohol-related deaths, injuries, and crashes were distributed by BAC using the methods in Miller, Lestina, and Spicer (1998). Alcohol-involvement rates decline with crash severity; effectiveness should be expected to vary as well as severity as a lesser percentage of crashes are affected by alcohol.

In some jurisdictions, police do not report alcohol involvement in non-fatal incidents or police counts could not be accessed. For the District of Columbia, Illinois, and Rhode Island, alcohol-related crash counts were estimated with a regression that had two explanatory variables – (1) alcohol-related fatal crashes and (2) vehicle miles traveled in urban areas. For Colorado, the District of Columbia, Illinois, Louisiana, Massachusetts, North Dakota, and Rhode Island, alcohol-related injury counts were estimated with a regression that had two explanatory variables – (1) total alcohol-related crashes and (2) the product of the % of crash deaths that were alcohol-related times total injuries. In both regressions, all coefficients were statistically significant at the 95% confidence level. The regressions explained more than 80% of the variance in the crash and injury counts for the States with data. Total crash injuries came from the State or from 1996 and 1997 Highway Statistics (Federal Highway Administration 1997, 1998).

Costs

Cost per alcohol-related fatality, injury, and crash, as well as sources of payment, were calculated by the methods in Blincoe, Seay et al. (2002) and Zaloshnja et al. (2001). The costs are NHTSA's latest estimates. Future costs are converted to present value with a 4% discount rate. Crash costs per mile driven at various BACs were developed using methods in Miller, Spicer, and Levy (1999). Costs per drink (a drink contains one-half ounce of alcohol) were obtained by dividing the State's impaired-driving costs by its alcohol consumption in 1998 from Williams et al. (2000). Auto insurance losses attributable to impaired driving were the product of total auto insurance losses from Panko (2001) and the percentage of the State's total motor-vehicle crash costs attributable to alcohol. External costs, the costs paid by people other than alcohol-impaired drivers, were computed by the methods in Levy and Miller (1995) and Blincoe (1996). All costs were adjusted to reflect State prices and wages with price adjusters from ACCRA (1998) and the Council of Economic Advisors (2001).

Prevention Savings

Miller (2001); Miller and Levy (1998, 2000); Miller, Galbraith and Lawrence (1998); Miller, Lestina and Spicer (1998); and Levy and Miller (1995) provided the basis for estimating the savings from alcohol strategies. They analyzed average national costs and impacts. We made State-specific price adjustments. Because impaired-driving rates differ by State, the benefits from prevention also will vary. To account for these differences, the benefits were adjusted by the ratio of alcohol-related crash costs per driver in the State versus the United States. Just adopting a legislative countermeasure does not mean it will achieve the average impact. It needs to be effectively implemented and well-publicized to have maximum effectiveness.

In the studies cited, the percentage reduction in alcohol-related crashes generally was estimated from evaluations of fatality impacts. None of the State estimates consider how differences in enforcement and other factors will cause effectiveness to vary between States. Sources of the effectiveness estimates were:

- **Administrative license revocation** from estimates of a 9% reduction in nighttime fatal crashes in Illinois, Mississippi and Nevada (Lacey, Jones and Stewart 1991); a 5%–9% reduction in nighttime crashes in New Mexico (Ross 1987); a 6% reduction in fatal single-vehicle nighttime crashes in eight States (Zador et al. 1988); and a 6% reduction in the rate of fatal crash alcohol involvement (Klein 1989). Following Miller, Lestina and Spicer (1998), the analysis uses a 6.5% reduction.
- **Zero tolerance** laws from multi-State analyses estimating reductions of 17% (Hingson et al. 1994) to 24% (Voas, Tippets and Fell 1999) in alcohol-related fatal crashes involving youth. The analysis uses a 20% reduction, which equates to a 4% reduction in all DUI fatalities because these laws only affect drivers under age 21.
- **.08 laws** from a systematic review of studies on effectiveness that concludes the average reduction in alcohol-related fatalities is 7% (Shults, Elder, Sleet, Nichols, Alao, Carande-Kulis, Zaza, Sosin, Thompson et al. 2001) with considerable variability between States.
- **Minimum Legal Drinking Age (MLDA)** from a National Highway Traffic Safety Administration study estimating that a MLDA of 21 prevents 700–1,000 traffic deaths annually among youth ages 18 – 20 (National Highway Traffic Safety Administration, 2001). A systematic review of studies estimates that MLDA reduces alcohol-related crashes among youth ages 18–20 by an average of 19% (Shults, Elder, Sleet, Nichols, Alao, Carande-Kulis, Zaza, Sosin, Thompson et al. 2001), which equates to a 4% overall reduction.
- **Graduated licensing** from studies of the impact on youth fatalities in California (29%, Hagge and Marsh 1988), Maryland (5%, McKnight et al. 1990), and New Zealand (8%, Langley et al. 1996). The analysis uses a conservative 5% reduction in youth fatalities (and a corresponding 2% reduction in alcohol-related fatalities) with a midnight curfew.
- **Intensive sobriety checkpoint programs** from a systematic review of 11 studies, are estimated to reduce alcohol-related crashes by 13%–27% and alcohol related crash injuries from 5%–23% (Shults, Elder, Sleet, Nichols, Alao, Carande-Kulis, Zaza, Sosin, Thompson et al. 2001). Across all of the studies, the average reduction is approximately 20%. Since the higher effectiveness estimates were derived from programs with strict systematic implementation, the more conservative estimate was used. The 15% effectiveness estimate recognizes that the average program may not be implemented as well as the model programs. Intensive, continuing statewide programs are rare.
- **Enforcing laws against serving intoxicated patrons** from a Michigan demonstration (Levy and Miller 1995) shows an 8.4% reduction in tavern-related arrests for DUI. Since tavern related DUIs cause a disproportionately large share of fatalities, this reduction is estimated to cause an overall 11% reduction in alcohol-related crash fatalities.
- **Server training** from Holder and Wagenaar (1994) which found a mandatory full-day training program implemented statewide in Oregon reduced single vehicle night-time injury crashes and presumably night-time DUI injury crashes by 23%. The analysis assumes 17% rather than 23% effectiveness for a full-day, face-to-face training program; the reduction recognizes that effectiveness of demonstrations usually is reduced when scaling up and replicating. Other research systematically reviewed by Shults, Elder, Sleet, Nichols, Alao, Carande-Kulis, Zaza, Sosin, Thompson et al. (2001) reveals reductions of 17%–33% for much narrower programs. Most of the programs yielding high effectiveness estimates were intensive demonstration programs.

Interventions Targeting Repeat Offenders

Four alternative sanctioning approaches are important for decreasing recidivism. Analysis of FARS data shows that 8%–12% of fatal alcohol-related crashes involved recidivists. The analysis uses the 1999–2000 estimate from FARS that 9.35% of alcohol-related fatal crashes could potentially be affected by these countermeasures. In cases where only information about the reduction in recidivism was available, we assumed the reduction in impaired driving crashes of recidivists equaled their reduction in convictions.

- **Automobile impoundment** for DUI offenders from a systematic review (Voas, Tippets and Taylor 1999) estimating a 50%-70% reduction in recidivism while vehicles were impounded or immobilized and a 30%–40% reduction thereafter. Overall, in the two years following impoundment, reductions averaged 38%–50% If all multiple offenders received the sanction, this implies a 3%–5% reduction in alcohol-related crashes. The analysis uses a conservative 4% reduction (9.35% affected * 38%).
- **Ignition interlock analysis** from data in Voas, Marques,Tippets and Beirness (1999). An interlock is estimated to have a specific deterrence effect on the sanctioned driver of 44% relative to hard suspension, or approximately 72%–78% relative to no sanction. These estimates suggest that if widely implemented, an interlock program would reduce alcohol-involved fatalities by 6%–10% while on the car. The analysis uses a 7% reduction (9.35% * 75%).
- **Electronically monitored house arrest** of repeat DUI offenders from Jones, Wiliszowski and Lacey (1996), which estimates 31% less recidivism while sanctioned. The 3%–4% reduction in alcohol-related crashes overall is derived by assuming that 31% less DWI convictions leads to a comparable reduction in alcohol-related crashes. The analysis uses a 3% reduction in DUI crashes (9.35% * 31%).
- **Intensive probation supervision with treatment for repeat DUI offenders** from Jones, Wiliszowski and Lacey (1996) which found Milwaukee County's program had 48% less recidivism while on probation, implying a 4%–6% reduction in alcohol-related crashes. The analysis uses a 4% reduction (9.35% * 48%).

Occupant Protection Measures

- **Primary safety belt laws** from a systematic review which concludes that a primary law raises belt use by an average of 14.1 percentage points (Dinh-Zarr, Sleet, Shults, Zaza, Elder, Nichols, Thompson, Sosin et al. 2001). FARS data suggest that 62% of occupants in fatal alcohol-related crashes are unbelted. With 45% belt effectiveness, that suggests the reduction in alcohol-related occupant fatalities would be 10% (62% unbelted * 45% effectiveness * 14.1% belt use increase / 38% belted) (NHTSA, 1999).
- **Child safety seats** from a new analysis that considers seating position and airbag presence (Miller et al. 2002). That analysis directly estimated the impacts of restraint use and seating position on injury cost per child involved in a tow-away crash with 1993–1999 data from NHTSA's Crashworthiness Data System. The computations use seat effectiveness from NHTSA (2001) and fatality data by seat use and alcohol involvement from FARS. Centers for Disease Control and Prevention (1997) finds that drinking drivers are more likely than other drivers to transport children improperly. A child safety seat law increases use by 24% on average (Zaza et al. 2001, Blomquist 1999). With 55% seat effectiveness and pre-law use in potentially fatal crashes at 20%, that reduces occupant fatalities in this age group by 15% (55% * 15% / (80%+20% * 45%)).
- **Motorcycle helmets** from NHTSA (2001) estimates that helmets reduce fatality risk by 29% and nonfatal injury risk by 15%. Helmet use and alcohol-involvement in motorcyclist fatalities are from FARS.

Definitions of Costs

Medical costs include hospital, physician, rehabilitation, prescription, and related payments. Coroner and premature burial costs for fatalities, and the costs of medically-related loss compensation through insurance and the courts are also included. Loss compensation omits time spent on the loss recovery process.

Other monetary costs include:

Work loss (lost productivity), which includes wages, fringe benefits, and household work lost by the injured, as well as the costs of productivity loss compensation. This category also includes productivity loss by those stuck in crash-related traffic jams and by co-workers and supervisors while recruiting and training replacements for disabled workers, investigating work-related crashes, and repairing damaged company vehicles. Excluded for lack of data are earnings lost by family and friends caring for injured adults and the value of schoolwork lost.

Public services costs of police, fire, ambulance, and helicopter services.

Property damage costs to repair or replace damaged vehicles and property including the costs of damage compensation.

Quality of life places a dollar value on the pain, suffering, and lost quality of life that victims and their families experience due to a death or injury.

To value the quality of life lost to fatal injuries, the starting point is to estimate the value people place on survival. The value of survival is measured from the amounts people spend (in dollars or time) for safety. About 75 technically sound "willingness to pay" studies have estimated this value (Miller, 2000). They examine such things as markets for auto safety features and smoke detectors, extra wages paid to get workers to take risky jobs, and speed choice while driving.

The value of survival is essentially the combined value of future earnings and quality of life. The quality of life cost per death is obtained by subtracting the lost future earnings.

The quality of life lost to nonfatal injury was valued in two steps (Miller, Lestina, and Spicer 1998). In the first, physicians rated the typical effects of different injuries on six dimensions of functioning: mobility, cognitive, bending and grasping, pain, sensory, and cosmetic. Data were also collected about a seventh dimension: the ability to work. Using surveys about the value people place on different dimensions of functioning, the data were combined to obtain a percentage of the value of survival lost to each injury. Again, subtracting lost future earnings yielded the quality of life costs per injury.

Since 1989, the U.S. Office of Management and Budget (1989) has required all federal regulatory benefit-cost analyses to include quality of life costs if they place a dollar value on saving lives.

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